

The Emerald Research Register for this journal is available at
www.emeraldinsight.com/researchregister



The current issue and full text archive of this journal is available at
www.emeraldinsight.com/0969-6474.htm

TLO
12,2

Higher education leadership roles in knowledge processing

Jeffery S. Martin and Russell Marion

Clemson University, Clemson, South Carolina, USA

140

Abstract

Purpose – To examine the critical roles of leadership in higher education and to define how such roles enable an environment that embraces the demands of a knowledge-based organization.

Design/methodology/approach – Through interviews with executive leadership in several higher education institutions, the ontology of knowledge management was established and the methods by which knowledge gaps were resolved were explored. The question of how leadership behaviors, policies, and programs enable or inhibit knowledge-processing activities was analyzed.

Findings – Leadership influence in six key areas emerged as significant in the study: environment manager, network manager, policy manager, crisis manager, knowledge gap manager, and future leader preparation. The authors confirmed that the leader has tremendous control over the knowledge-processing environment and the role of leadership has broader influence than the resolution of knowledge gaps.

Originality/value – By understanding leadership roles in knowledge management, organizations and their leaders can enhance the learning capacity of the organization.

Keywords Knowledge management, Higher education, Leadership, Complexity theory, Social roles

Paper type Research paper

Introduction

This study examines how leadership in higher education fosters an environment that embraces the demands of a knowledge-based organization. Knowledge environments demand leadership that can enable highly complex organizational processes, creativity, and knowledge growth (Manville and Ober, 2003, Uhl-Bien *et al.*, 2004). We argue that this style of leadership is applicable (and should be observed) during episodes of “epistemic gaps,” or disruptions in the daily flow of organizational business. The processes utilized in resolving these gaps are referred to as “knowledge processing.” The central question addressed by the study, then, is, how do leadership behaviors, policies, and programs enable or inhibit knowledge-processing activities?

The higher education setting is ideal for such study because it offers a complex environment comprised of networks of independent agents that are tied together by common traditions and bonds. Problems with which higher education executives struggle include “exorbitant tuition, tenure, unnecessary research, bloated bureaucracies, low admission and graduation standards, remediation, numerous existing programs, light teaching loads, lack of accountability, narrow-minded faculty unions, and shared governance that leaves nobody in charge” (Carlin, 1999). Such problems, or the perceptions that such problems exist, generate a rich matrix of epistemic gaps for executives to resolve.

In this paper we discuss roles of leadership in maintaining an enabling knowledge-processing environment and in controlling inhibitors that limit the ability of the organization to adapt, change and, ultimately, manage knowledge gaps. We argue that in complex higher education settings, leadership best serves by enabling (as opposed to enacting or controlling) the knowledge-processing environment. To



understand this role of leadership, we interviewed nine presidents and provosts in five institutions of higher education with the goal of understanding how they resolve epistemic gaps and enhance the knowledge-processing environment. Leadership influence in six key areas emerged as significant in the study:

- (1) Environment manager.
- (2) Network manager.
- (3) Policy manager.
- (4) Crisis manager.
- (5) Knowledge gap manager.
- (6) Future leader preparation.

Leadership and knowledge management

McElroy (2003a) challenges leaders to imagine an organization in which innovation is the top priority, a company in which the culture supports creativity and problem solving. Barnevik states:

Organizations ensure that (people) use only 5 to 10 percent of their abilities at work, the challenges for leaders are to learn how to recognize and employ that untapped ability (quoted in Bennis, 1999, p. 19).

The reality implicit in these observations is that today's organizations exist in a new "knowledge era" (Boisot, 1998; Drucker, 1999; Drucker *et al.*, 1998; Hitt, 1998; Hitt *et al.*, 1995, 1998; Nonaka and Takeuchi, 1995) in which an essential ingredient of organizational function is the development and integration of knowledge (i.e. tapping into and utilizing the 90 percent of worker ability that has been neglected) by all agents of the organization. Maintaining an inviting environment for organizational learning to occur is a leadership priority, and this environment must become integrated into the very fabric of the organizational being.

Knowledge-managing leadership invites creative responses to these demands by developing organizational environments that welcome experimentation and open discussion (Uhl-Bien *et al.*, 2004). Emergent problem solving has become the new leadership imperative in the knowledge era. Leadership in maintaining a knowledge-processing environment and the codification of new knowledge are foundational to the competitive edge in this economy.

A review of current literature suggests there is a critical interplay between the process of managing the organization – managing "business processing" – and the processes of resolving knowledge gaps that develop within the organization – "knowledge processing" (McElroy, 2003b), and managing knowledge processes. This cycle of organizational learning is modeled by McElroy and Firestone as a Knowledge Life Cycle (McElroy (2003b); this model serves as the framework for the study). As McElroy (2003b) and others state, knowledge processing speaks of new ideas, new insights, and innovation from interactions among people and/or knowledge. As new knowledge claims (i.e. proposed solutions to knowledge gaps) are produced, tested, evaluated and accepted, they then become solutions and are integrated into the management of the organization. This return to business-processing mode indicates that the organization has resolved the knowledge conflict and, in essence, has learned.

Figure 1 illustrates the relationship between business processing (demonstrated as knowledge use), knowledge production, and knowledge integration – McElroy's (2003b) knowledge-processing life cycle. Business-processing functions include strategic discussions and decisions for dealing with existing and clearly understood challenges. Such strategizing creates predetermined solutions for dealing with problems that arise in business processing modes. On occasion, however, predetermined solutions are not available. This void may be the result of a new environment, change in technology, or change in organizational culture. Such voids constitute a knowledge gap that must be resolved by knowledge processing. Once resolved, the solution is integrated into the business-processing strategies of the organization, a process that McElroy calls knowledge integration.

The ideal interaction between business processing and knowledge production is constant, seamless, and barrier free. In a dysfunctional setting, barriers exist within the knowledge-processing environment that inhibit the relationship between these functions and obstruct organizational learning. One role of leadership is to remove barriers that suppress evaluation of business practices. Often this requires release of personal power for the good of network development. According to Pfeffer (1992), managing with power means recognizing that in almost every organization, there are varying interests. Bennis (1999) suggests that power in the knowledge era resides more with all employees than with owners or managers. Leadership power, from this perspective, is a tool to enhance emergent behaviors among workers. Rather than prescribing processes for learning, then, leadership, according to this view, can amount to managing the conditions for learning and not learning itself (McElroy, 2003b).

Higher education

Higher education stakeholders are exhibiting renewed interest in monitoring productivity and accountability in their institutions, an interest that suggests lost confidence in the academy (Carlin, 1999). Boards of trustees and senior leaders across the country are pressured to run higher education "like a business" with profit/loss statements and improved returns on investments. Tenure is being challenged, with nonacademic leaders referring to tenure as "an immoral business practice with a mandate for faculty to be unaccountable to the customers they serve" (Carlin, 1999).

Higher education has many of the attributes of a professional bureaucracy (Mintzberg, 1979). It has highly trained personnel; standard, yet complex procedures; authority of expertise; commitment to profession; and high levels of professional autonomy. There are extensive patterns of networks in higher education. Faculty members interact across disciplines to enhance teaching and research, administrative departments collaborate to achieve complex goals, and students are challenged to seek

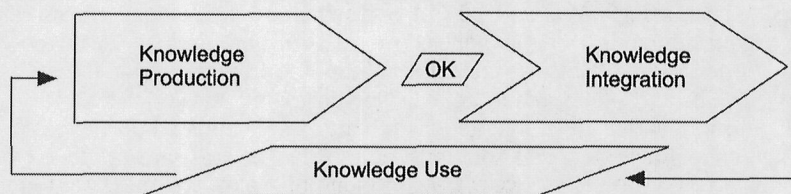


Figure 1.
Social life cycle view of
knowledge processing

Note: Used by permission of Mark W. McElroy 2003

new paradigms in cognitive development. Healthy networks enable interaction and conflict that challenge this community to attain higher levels of understanding of complex issues. These challenges and this environment provide an ideal setting for studying leadership roles in knowledge processing.

Research design

This study explores the role of leadership in resolving knowledge, or epistemic, gaps in business-processing activities. Nine presidents and provosts from five institutions were interviewed in order to explore knowledge management concepts in higher education and to understand those concepts relative to the Knowledge Life Cycle. Each interview first explored the ontology of knowledge processing in higher education, and then examined leadership patterns that enhance or inhibit knowledge processing:

Ontology is an explicit specification of a conceptualization that is an abstract, simplified view of the world that represents some purpose. Ontology is a description (like a formal specification of a program) of the concepts and relationships that can exist for an agent or a community of agents (Gruber, 1993).

In this study, we sought concepts that were of common concern to presidents, chancellors and senior academic offices. First and foremost, these leaders acknowledged that higher education is experiencing a significant transition in daily business-processing issues. Ontological concepts that emerged from the data were concerned with protecting the mission and future of the institution, identifying and strengthening relationships, and understanding the uniqueness of each institution in order to enhance learning. Finally, higher education institutions were identified as complex organizations (McKelvey, 2001, 2003a, b, 2004), or organizations made-up of multiple, interacting networks of agents and groups with bottom-up authority for decision making and initiative.

Interview participants were selected to offer broad leadership exposure of the higher education setting. The sample represented diversity in types, sizes and institutional missions along with diversity in training and education of interviewees. All participants were senior leaders – presidents and provosts – in higher education. An investigative strategy was employed; thus, clarification of study questions evolved as the study progressed. In addition to interviews, data were collected through observations and secondary sources.

Data were analyzed through the use of grounded theory, a technique that requires data to be categorized by continuously comparing incidents until common characteristics emerge (Patton, 1990). According to Patton (1990, p. 67), grounded methodology “takes the researcher into and close to the real world so that the results and findings are ‘grounded’ in the empirical world”. Creswell (1998, p. 56) states that the intent of a grounded theory study is to generate or discover a theory that relates to a particular situation:

The researcher collects primary interview data, makes multiple visits to the field, develops and interrelates categories of information, and writes theoretical propositions or hypotheses or presents a visual picture of the theory.

In this study, each interview was transcribed, analyzed, and coded from patterns derived following the review of literature and development of study propositions. These patterns were subject to modification based on observations of the empirical data.

Findings: leadership roles in knowledge management

The findings clearly suggest that leadership plays important roles in the knowledge-processing dynamic. Examination of the data revealed six key leadership roles that impact the knowledge-processing environment. These roles are summarized in Table I.

Leadership and knowledge management: discussion

Environment manager

A leader's role is to establish an environment that recognizes and encourages problem solving. Every participant in the study observed that an energetic knowledge-processing environment is the backbone of organizational learning. They felt that a fundamental change in culture must occur so that the learning environment can emerge. Respondents portrayed this transformation as a slow, systematic

Environment manager	A leader's role is to break negative organizational behavior and to establish new methods of organizational problem solving. Before knowledge gaps can be resolved, the environment has to be transformed into one that enables knowledge processing. An essential leadership role is modeling this openness for other people in the organization
Network manager	Without the opportunity to examine knowledge gaps and establish networks to test and validate solutions, knowledge processing will break down. A leader role is to support the creation and application of networks to examine knowledge gaps and to identify and remove barriers to network development. The strength of organizational networks is much larger than individual relationships; it is a collusion of multiple roles and expertise bound together to strengthen the organization. This enables creative thinking and strengthens collaboration and knowledge-processing networks
Policy manager	Clear policy gives the entire organization guidance in the knowledge-processing cycle, clarifying roles and empowering individual action. Policy gives employees direction and confidence in participating in the business processing of the organization. The leader role is to balance policy matters and redefine historic bureaucracy in order to encourage consistency and openness. Also, leadership controls the process of committing the organization to action. If this "power" to commit the organization is strictly controlled, the knowledge-processing environment is negatively impacted
Crisis manager	Crisis can lead to an environment of learning. Patterns that emerged in this context are the application of power and control to solve immediate, short-term issues for the organization to move in a positive direction. Regardless of the processing of knowledge gaps, a role of leadership is to ensure that organizational objectives are met. The leader must be one who challenges the status quo in all levels of the operation
Knowledge gap identifier	The ability to identify knowledge gaps is a critical leadership skill. Once a gap is identified, the leader analyzes the components of the knowledge gap to determine potential threats to the organization. The leader must first grasp the impact of the gap on organizational mission. If the gap requires external expertise, the leadership role is to seek appropriate resources
Future leader preparation	The leader role is to model the environment through careful selection of key team members and to establish quality mentorship programs to prepare future leaders. Future leaders must be trained to be especially sensitive to knowledge-processing behavior

Table I.
Leadership roles in
higher education
knowledge processing

transition with many challenges to overcome. Such an “enabling” environment creates open conditions in which policy and knowledge gap evaluations occur. As knowledge gaps are identified in business processing, there must be an indiscernible transition to knowledge production. As one respondent stated, often this meant a change in the very fabric of the institution:

We had to change the culture of the institution. We had to establish a cycle of learning and striving for success based upon our focus – instead the institution was in a downward cycle. So, that environment, even though it's not desirable, is not necessarily a bad place for leadership to begin to emerge. So, the process that we needed to do was exactly what people were hungry for. They wanted to engage in solving the problem but have been caught in this spiral.

In a dysfunctional setting, barriers may exist within knowledge-processing activities. At the discretion of leadership, barriers may or may not be removed. A variety of barriers “inhibit” the seamless transitions vital to knowledge processing, and a role of leadership is to identify and remove barriers to enhance this cycle. Leadership must acknowledge the need for an environment in the organization that enables barrier free knowledge processing. Knowing when to intervene in unproductive knowledge processing is an essential skill for leadership.

Network manager

Healthy networks are engines that run knowledge processing. An essential leadership role, according to respondents, is that of building and nurturing networks of interaction and interdependency. The leader must legitimize network building by directly engaging in network building activities. The leader can enhance network interaction through delegation by providing encouragement and resources to subordinates, or by removing institutional barriers that interfere in network construction. Leaders should initiate, encourage, catalyze, make connections, and learn when to leave matters alone (Marion, 2002).

The collaborative nature of healthy networks allows for a free interchange of ideas. Trust and openness are essential. One participant suggested marriage as an example:

It is really important to me that they understand that it is like a marriage. There are sacrifices and there are gains. You don't always gain. And sometimes you will gain by sacrificing to somebody else and that is what a team is all about.

An additional key ingredient for healthy networks is diversity. Agents in the process need different backgrounds, training, and experiences in order to establish a well-rounded perspective. One participant described this as an intentional action:

If I am putting a team together to study something or to write a grant or something, I will try to construct it with people who I know have a mixture of all those capabilities. You don't want a team that is all the same. That would be death! You know, I welcome diversity [as a leader] because you play their strengths and weaknesses off on one another. If you had everybody the same you would have a disaster on your hands. It would be awful.

Without the opportunity to examine knowledge gaps and establish networks to test and validate solutions, knowledge processing will break down. The strength of organizational networks is much greater than interpersonal relationships; it is a collusion of multiple roles and expertise bound together to strengthen the organization. This enables creative thinking and strengthens collaboration and knowledge-processing networks.

One continuing pattern suggested by the findings is the need for knowledge processing to be a collaborative effort engaging all levels of the organization. The strength of knowledge processing rests on the successful integration of social networks. Networks are made up of a group of individuals who share common and diverse backgrounds and are dedicated to the resolution of a knowledge gap. McElroy (2003c) states this well:

I think these communities or networks are beautiful illustrations of knowledge processing activities. Typically, when these communities are engaged, they are not engaging in business processing. They are doing something else. They are either producing knowledge or sharing knowledge, none of which are the same as using knowledge in the business-processing context.

Policy manager

Clear policy gives the entire organization guidance in the knowledge-processing cycle by clarifying roles and empowering individual action. Policy gives employees direction and confidence in participating in the business processing of the organization. The leader role is to balance policy matters against historic bureaucracy in order to encourage consistency and openness. Also, leadership controls the process of committing the organization to action. If this "power" to commit the organization is strictly controlled, the knowledge-processing environment is negatively impacted.

A role of the senior leader is continually to seek ways to improve the institution, and one means to accomplish this is consistently to evaluate the policy base of the organization. An environment of continual renewal and self-evaluation may expand the concept of knowledge processing beyond seeking solutions to knowledge gaps. Participants indicated that the status quo in a competitive environment is not acceptable and that the organization must continually seek new and better solutions to knowledge gaps. One respondent stated:

My favorite question is "Why?" I probably drive people crazy with that but why do we do the things we do? And, I think part of a leader's job is to ask that question. Because I don't think we change unless we ask hard questions. We change our habits only if we have a heart attack or something else. I think we only change when we are forced to unless creative and visionary leadership is in place that says, "We either change or we go away".

Continuous self-evaluation of policy and programs is an essential environmental element to support knowledge processing as a seamless, transparent activity. Self-evaluation may identify emerging gaps that could erupt into a crisis condition, thus impacting the timeframe for effective knowledge processing. The worst case, as shared by one participant, is that "the stagnant organization that does not ask 'why' can disappear into the competitive landscape".

Crisis manager

Crisis can lead to an environment of learning. We found a correlation between crisis response and autocratic leadership. Patterns that emerged in this context are the application of power and control to solve immediate, short-term issues in order for the organization to move in a positive direction. In essence, when the organization was "broken," knowledge processing tended to be abdicated. Time appeared to be the enemy.

However, when the crisis environment was not seen as critical, opportunities were discovered to establish an inclusive course of action. Examples of transparent and

inclusive learning processes were shared by several respondents. New and creative networks evolved as a result. In the eyes of several participants, it achieved a basic purpose of uniting the organization:

Crisis is a great teambuilding foundation. You can really build team in the middle of crisis. It is one of the advantages of going into an environment and an organization that is in crisis because the call for leadership is so powerful. You tend to get that kind of cooperation and support and involvement and engagement because the building is on fire and we've got to put the fire out.

Organizational crisis can both benefit and inhibit the knowledge-processing environment. The data suggest that organizational crisis can serve as a precursor to team development and unity. Crisis periods can clarify and delineate secondary issues from primary priorities and direct the energy of the team. However, crisis conditions are detrimental to knowledge processing because they decrease time and resources. One should not assume it enhances organizational learning on a long-term basis. Once the crisis is averted, old programs and policies can return. The end result may be a resolved crisis, but the organization has not resolved the knowledge gaps that may have initiated the crisis in the first place.

Knowledge gap identifier

The ability to identify knowledge gaps is a critical leadership skill. Once a gap is identified, the components of the knowledge gap are analyzed to determine potential threats to the organization. The leader must have a sense of the organization and a certain "instinct" to know when something is not right. This can emerge as a general sense of discomfort with the organization, or a more specific sense that the business-processing capacity of the organization is hindered in some manner. Once the gap is recognized and placed in context, the organization can engage in knowledge processing. An important component to this consideration is whether there are suitable internal resources and expertise to resolve the gap or if external resources are necessary.

Interview discussions on "how do you know when a knowledge gap exists" brought substantial discussion and reflection. Some examples of knowledge gap indicators are:

Sitting around and scratching our heads and not getting anywhere and not using talent on campus was not productive.

You could tell instinctively when that would take place. You would see the energy level drop and the leadership team would have somewhat of a reptilian glaze over their eyes.

A lot of people came through that door and resigned. There were a lot of good people who realized they just couldn't do the job and to their credit said, "I'm just way over my head here. I don't even know what you're talking about".

Just a tremendous amount of conversation that was not going anywhere.

Circular conversations, just bringing up all the problems but offering no solutions. Yeah – when everything is stymied and nothing is coming.

Knowing a gap exists gives the leader insight into the pulse of the organization. Early recognition can reduce unproductive frustration and confusion. In effect, with early recognition, the organization does not waste resources attempting to manage unresolved gaps.

Future leader preparation

The leader role is to model the environment through careful selection of key team members and to establish quality mentorship programs to prepare future leaders. Future leaders must be trained to be especially sensitive to knowledge-processing behavior. Senior executives participating in this study were concerned for the future leadership of higher education. A tremendous transition in faculty will occur as baby boomer faculty members retire in large numbers. This void will create a unique challenge and opportunity. New personnel could lead to an opportunity to relieve historic patterns and create a new culture in the organization. One participant stated:

There is a certain replenishing that goes on when people retire and people take other jobs or we create new positions. But it has also got to be a part of a new set of goals, a new vision, and not for its own sake. It has to have meaning, substance, and depth, or it won't be embraced. That kind of shake up is good.

Development of new leadership was seen as a strategic initiative. The leader role is to model the environment through careful selection of key team members. The primary answer to the question of future leadership rested on existing leaders themselves. The role of quality mentorship was discussed repeatedly. Every interviewee shared a story of important mentors in their professional careers. For example:

Mentors are critical to leadership in higher education. I have had four that I trust implicitly. Not only do they each offer sound and honest advice on how I manage the institution, they share their perspectives on my wellbeing.

Further discussion

The purpose of this study was to explore knowledge processing in higher education organizations and to examine the role of leadership as a mechanism to enhance knowledge processing. We conclude that the Knowledge Life Cycle is a useful framework for understanding knowledge management in higher education. Specific leader roles that impact knowledge processing were identified and discussed in this paper. A skillful leader will recognize indicators of knowledge gaps and will engage the organization in knowledge processing. Learning is enhanced when an organization is open and transparent. The leader has an important role in overseeing an organizational environment that encourages knowledge processing. This organizational environment fosters networks that can emerge to resolve knowledge gaps. Further, crisis is seen as an opportunity to strengthen knowledge processing activities. New leaders must be developed who acknowledge the value of knowledge processing and encourage knowledge holders at all levels of the organization to become more involved in the identification and resolution of knowledge gaps.

There must be structure in the organization for knowledge processing activities at multiple levels in the organization to succeed. Resistance does exist, but this is usually due to employee lack of confidence, poor structure, or unequal distribution of power within the organization. In this study, we saw limited resistance from respondents to participating in organizational learning activities. In fact, we found that a major leadership challenge was making higher education more inclusive and welcoming to traditional, external stakeholders.

Personnel resistance to change was the most discussed inhibitor to knowledge processing. This includes active and passive resisters who prefer previous methods of

operation and who did not welcome a new paradigm. Often resistance comes as a result of a period of adjustment to new leadership. Also, a perception exists that participating in networks dedicated to seeking solutions is an added responsibility. There is ample opportunity for leadership to educate personnel on the personal and organizational benefits of participating in knowledge processing.

One indicator of resistance came from a surprising source – success. It is possible for organizations to feel as though there is no need to evaluate performance, or to engage in knowledge processing. The leader role is to challenge this type of comfort. If too comfortable, the organization loses its edge, and organizational goals are not met. A vision that stretches the organization should create knowledge gaps.

An important question for leadership with respect to knowledge processing is when do you know when the organization has successfully resolved a knowledge gap? Instrumental to this question is when does the organizational environment achieve an open, continuous, seamless knowledge-processing environment? One indicator of achieving this plateau is a change in the role of the leader. In one example from the study, a healthy environment was one that functioned well, independent of the leader's direct involvement:

I know when new knowledge is integrated when I no longer have to come up with the questions. This tells me that there is a healthy knowledge cycle and issues are being addressed at the appropriate, lower level of the organization.

From the following respondent comment, success in this organization was being achieved as a result of good solutions being introduced to resolve gaps. Increased participation in organizational challenges and a willingness to take risks were further indications that the environment was healthy. Good outcomes were a result:

Indicators that faculty and staff were “getting it.” SAT admissions scores increased annually, the value of athletics was not only seen in wins and losses but in things like graduation rates and community outreach. Faculty were willing to reach out and take risks. Donors stepped forward and financially supported the institution with endowed faculty positions. Faculty, while still critical, were looking for solutions – not just sitting back and criticizing the leadership of the institution.

Power in higher education is used to maintain and manage environments. The data indicates that healthy control over systems was implemented when there was a clear goal of engaging the higher education community. If, in the perception of the leadership, the organization had become dysfunctional in some manner, acceptable direct intervention was required. Through data collection, several instances of a broken organization were identified and the leader was forced into a period of micromanagement. This level of intervention was needed until the knowledge-processing capacity was reestablished and the organizational environment was capable of assuming authority over this process. The data spoke clearly that power is a leadership tool that should be used to enhance the knowledge-processing capacity of the organization.

The role of leadership extends beyond enhancing an environment to resolve knowledge gaps. Beyond identifying and resolving knowledge gaps, an important leadership role is to challenge the organization consistently to engage in continuous internal evaluation. The leader must also cast a critical eye on existing policy and programs to seek new and better methods to achieve organizational

objectives before the level of “knowledge gap” is reached. Ironically, in an ideal setting, the leader not only responds to knowledge gaps, the leader creates them. There is a constant internal assessment to establish “creative abrasion” (Leonard and Straus, 1998) within business processing. This essential leadership role deserves deeper consideration as it redefines the role of leadership within knowledge-management activities.

One function of leadership is to enhance the ability of the organization to meet objectives. Even with tremendous funding pressures, increased expectations from internal and external stakeholders, and a culture that promotes critical and free interaction, higher education can establish effective knowledge processing that enables organizational learning. It is these pressures that lead to knowledge gaps. Understanding and properly applying strategies to enhance knowledge processing will establish an environment that not only identifies knowledge gaps, but welcomes them. These gaps, properly evaluated and codified, will strengthen higher education.

References

- Bennis, W. (1999), “The leadership advantage”, *Leader to Leader*, Vol. 12, Spring, pp. 18-23.
- Boisot, M. (1998), *Knowledge Assets: Securing Competitive Advantage in the Information Economy*, Oxford University Press, Oxford.
- Carlin, J. (1999), “Restoring sanity to an academic world gone mad”, *The Chronicle of Higher Education*, Vol. 46, November 5, p. A76.
- Creswell, J. (1998), *Qualitative Inquiry and Research Design: Choosing among Five Traditions*, Sage Publications, Thousand Oaks, CA.
- Drucker, P. (1999), *Management Challenges for the 21st Century*, HarperCollins, New York, NY.
- Drucker, P., Leonard, D., Straus, S., Brown, J. and Garvin, D. (1998), *Harvard Business Review on Knowledge Management*, Harvard Business School Publishing, Boston, MA.
- Gruber, T. (1993), “What is an ontology?”, available at: www-ksl.stanford.edu/kst/what-is-anontology.html
- Hitt, M. (1998), “Presidential address: twenty-first century organizations: business firms, business schools, and the Academy”, *The Academy of Management Review*, Vol. 23 No. 2, pp. 218-24.
- Hitt, M., Ireland, R. and Hoskisson, R. (1995), *Strategic Management: Competitiveness and Globalization*, West, St Paul, MN.
- Hitt, M., Keats, B. and DeMarie, S. (1998), “Navigating in the new competitive landscape: building strategic flexibility and competitive advantage in the 21st century”, *Academy of Management Executive*, Vol. 12 No. 4, pp. 22-42.
- Leonard, D. and Straus, S. (1998), “Putting your company’s whole brain to work”, *Harvard Business Review*, issue on Knowledge Management, July-August.
- McElroy, M. (2003a), *Blazing New Trails in Knowledge and Risk Management*, Macroinnovation Associates, LLC, Windsor, VT, available at: www.macroinnovation.com/nkm.htm
- McElroy, M. (2003b), *The New Knowledge Management: Complexity, Learning and Sustainable Innovation*, KMC Press/Butterworth-Heinemann, New York, NY.
- McElroy, M. (2003c), personal communication.
- McKelvey, B. (2001), “Energizing order-creating networks of distributed intelligence”, *International Journal of Innovation Management*, Vol. 5, pp. 181-212.

- McKelvey, B. (2003a), "Emergent order in firms: complexity science vs the entanglement trap", in Mitleton-Kelly, E. (Ed.), *Complex Systems and Evolutionary Perspectives on Organizations*, Elsevier Science, Amsterdam.
- McKelvey, B. (2003b), "Toward a 0th law of thermodynamics: order creation complexity dynamics from physics and biology to bioeconomics", *Journal of Bioeconomics*, Vol. 6 No. 1, pp. 1-31.
- McKelvey, B. (2004), "Microstrategy from macroleadership: distributed intelligence via new science", in Lewin, A. and Volberda, H. (Eds), *Mobilizing the Self-renewing Organization*, M.E. Sharpe, Armonk, NY.
- Manville, B. and Ober, J. (2003), "Beyond empowerment: building a company of citizens", *Harvard Business Review*, January, pp. 48-53.
- Marion, R. (2002), *Leadership in Education: Organizational Theory for the Practitioner*, Merrill/Prentice-Hall, Upper Saddle River, NJ.
- Mintzberg, H. (1979), *The Structuring of Organizations: A Synthesis of the Research*, Prentice-Hall, Englewood Cliffs, NJ.
- Nonaka, I. and Takeuchi, H. (1995), *The Knowledge-creating Company*, Oxford University Press, Oxford.
- Patton, M. (1990), *Qualitative Evaluation and Research Methods*, Sage, Newbury Park, CA.
- Pfeffer, J. (1992), *Managing with Power: Politics and Influence in Organizations*, Harvard Business School Press, Boston, MA.
- Uhl-Bien, M., Marion, R. and McKelvey, B. (2004), "Complex leadership: shifting leadership from the industrial age to the knowledge era", paper presented at the National Academy of Management Meeting, New Orleans, LA.